gamma-Hexachlorocyclohexane (gamma-HCH) (CASRN 58-89-9)

MAIN CONTENTS

0065

gamma-Hexachlorocyclohexane (gamma-HCH); CASRN 58-89-9

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR gamma-HCH

File First On-Line 01/31/1987

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	on-line	03/01/1988
Inhalation RfC Assessment (I.B.)	no data	07/01/1992
Carcinogenicity Assessment (II.)	no data	10/01/1993

_I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

_I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
CASRN -- 58-89-9
Primary Synonym -- Lindane
Last Revised -- 03/01/1988

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these

concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

__I.A.1. Oral RfD Summary

Critical Effect	Experimental Doses*	UF	MF	RfD
Liver and kidney toxicity	NOAEL: 4 ppm diet [0.33 mg/kg/day (females)]	1000	1	3E-4 mg/kg/day
Rat, Subchronic Oral Bioassay	LOAEL: 20 ppm diet [1.55 mg/kg/day (males)]			
Zoecon Corp., 1983				

*Conversion Factor -- Converted dose calculated from actual food consumption data

__I.A.2. Principal and Supporting Studies (Oral RfD)

Zoecon Corporation. 1983. MRID No. 00128356. Available from EPA. Write to FOI, EPA, Washington D.C. 20460.

Twenty male and 20 female Wistar KFM-Han (outbred) SPF rats/treatment group were administered 0, 0.2, 0.8, 4, 20, or 100 ppm lindane (99.85%) in the diet. After 12 weeks, 15 animals/sex/group were sacrificed. The remaining rats were fed the control diet for an additional 6 weeks before sacrifice. No treatment-related effects were noted on mortality, hematology, clinical chemistry, or urinalysis. Rats receiving 20 and 100 ppm lindane were observed to have greater-than-control incidence of the following: liver hypertrophy, kidney tubular degeneration, hyaline droplets, tubular distension, interstitial nephritis, and basophilic tubules. Since these effects were mild or rare in animals receiving 4 ppm, this represents a NOAEL. The reviewers of the study calculated the dose to be 0.29 mg/kg/day for males and 0.33 mg/kg/day for females, based on measured food intake.

In a 2-year feeding study (Fitzhugh, 1950), 10 Wistar rats/sex/group were exposed to 5, 10, 50, 100, 400, 800, or 1600 ppm lindane. Slight liver and kidney damage and increased liver weights were noted at the 100 ppm level. If a food intake equal to 5% body weight is assumed, a NOAEL of 2.5 mg/kg bw/day (50 ppm) can be determined from this assay. In a 2-year bioassay (Rivett et al., 1978), four beagle dogs/sex/group were administered 0, 25, 50, or 100 ppm lindane in the diet. Treatment-related effects noted in the animals of the 100 ppm group were increased serum alkaline phosphatase and enlarged dark friable livers. A NOAEL was determined to be 50 ppm (1.6 mg/kg bw/day).

__I.A.3. Uncertainty and Modifying Factors (Oral RfD)

UF -- A factor of 10 each was employed for use of a subchronic vs. a lifetime assay, to account for interspecies variation and to protect sensitive human subpopulations.

MF -- None

__I.A.4. Additional Studies/Comments (Oral RfD)

Data on reproductive effects of lindane are inconclusive. Most reports indicate that hexachlorocyclohexane isomers are nonteratogenic.

__I.A.5. Confidence in the Oral RfD

Study -- Medium
Database -- Medium
RfD -- Medium

The principal study used an adequate number of animals and measured multiple endpoints. Since there are other reported chronic and subchronic studies, confidence in the database is medium. Medium confidence in the RfD follows.

__I.A.6. EPA Documentation and Review of the Oral RfD

Source Document -- U.S. EPA, 1985

The RfD in the Drinking Water Criteria Document has been extensively reviewed by U.S. EPA scientists and selected outside experts.

Other EPA Documentation -- None

Agency Work Group Review -- 01/22/1986

Verification Date -- 01/22/1986

__I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

Back to top

_I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
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Not available at this time.

Back to top

_II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
CASRN -- 58-89-9
Primary Synonym -- Lindane

Not available at this time.

Back to top

_III. [reserved]
_IV. [reserved]
_V. [reserved]

_VI. Bibliography

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
CASRN -- 58-89-9
Primary Synonym -- Lindane
Last Revised -- 08/01/1991

_VI.A. Oral RfD References

Fitzhugh, O.G., A.A. Nelson and J.P. Frawley. 1950. The chronic toxicities of technical benzene hexachloride and its alpha, beta and gamma isomers. J. Pharmacol. Exp. Ther. 100: 59-66.

Muller, D., H. Klepel, R.M. Macholz, H.J. Lewerenz and R. Engst. 1981. Electroneurophysiological studies on neurotoxic effects of hexachlorocyclo- hexane isomers and gamma-pentachlorocyclohexene. Bull. Environ. Contam. Toxicol. 27(5): 704-706.

Rivett, K.F., H. Chesterman, D.N. Kellett, A.J. Newman, and A.N. Worden. 1978. Effects of feeding lindane to dogs for periods of up to 2 years. Toxicology. 9: 273-289.

U.S. EPA. 1985. *Drinking Water Criteria Document for Lindane.* Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

Zoecon Corporation. 1983. MRID No. 00128356. Available from EPA. Write to FOI, EPA, Washington, DC 20460.

Back to top

_VI.B. Inhalation RfC References

None

Back to top

_VI.C. Carcinogenicity Assessment References

None

Back to top

_VII. Revision History

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
CASRN -- 58-89-9
Primary Synonym -- Lindane

Date	Section	Description
03/31/1987	IV.A.	Additional pesticide AI data added
03/01/1988	I.A.1.	Principal study citation corrected
03/01/1988	I.A.1.	Dose conversion corrected
03/01/1988	I.A.2.	Text revised
03/01/1988	III.A.	Health Advisory added
08/01/1990	III.A.10	Primary contact changed
08/01/1990	IV.F.1.	EPA contact changed
08/01/1991	VI.	Bibliography on-line
01/01/1992	I.A.7.	Secondary contact changed
01/01/1992	IV.	Regulatory actions updated
07/01/1992	I.B.	Inhalation RfC now under review
10/01/1993	II.	Inadvertently listed as under review
08/01/1995	I.B.	EPA's RfD/RfC and CRAVE workgroups were discontinued in May, 1995. Chemical substance reviews that were not completed by September 1995 were taken out of IRIS review. The IRIS Pilot Program replaced the workgroup functions beginning in September, 1995.
04/01/1997	III., IV., V.	Drinking Water Health Advisories, EPA Regulatory Actions, and Supplementary Data were removed from IRIS on or before April 1997. IRIS users were directed to the appropriate EPA Program Offices for this information.
01/09/2002	I.A., II.	This chemical is being reassessed under the IRIS Program.
02/09/2004	I.A., II.	This chemical is no longer being reassessed under the IRIS Program. See Federal Register February 9, 2004 (Volume 69, Number 26).

Back to top

_VIII. Synonyms

Substance Name -- gamma-Hexachlorocyclohexane (gamma-HCH)
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Primary Synonym -- Lindane
Last Revised -- 01/31/1987

58-89-9

AALINDAN
AFICIDE
AGRISOL G-20
AGRONEXIT
AMEISENATOD
AMEISENMITTEL MERCK
APARASIN
APHTIRIA
APLIDAL
ARBITEX
BBH
BEN-HEX
BENTOX 10
gamma-BENZENE HEXACHLORIDE
BENZENE HEXACHLORIDE-gamma-isomer
BEXOL
BHC
gamma-BHC
CELANEX
CHLORESENE
CODECHINE
CYCLOHEXANE, 1,2,3,4,5,6-HEXACHLORO-, gamma-isomer
DBH
DETMOL-EXTRAKT
DETOX 25
DEVORAN
DOL GRANULE
DRILL TOX-SPEZIAL AGLUKON
ENT 7,796
ENTOMOXAN
EXAGAMA
FORLIN
GALLOGAMA
GAMACARBATOX
GAMACID
GAMAPHEX
GAMENE
GAMISO
GAMMA-COL
GAMMAHEXA
GAMMAHEXANE
GAMMALIN
GAMMALIN 20
GAMMATERR
GAMMEX
GAMMEXANE
GAMMOPAZ
GEXANE
HCCH
HCH
gamma-HCH
HECLOTOX
HEXA
HEXACHLORAN
HEXACHLORANE
gamma-HEXACHLORANE
gamma-HEXACHLORAN
gamma-HEXACHLOR
gamma-HEXACHLOROBENZENE
1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE
1-alpha,2-alpha,3-beta,4-alpha,5-alpha,6-beta-HEXACHLOROCYCLOHEXANE

Hexachlorocyclohexane, gamma-
gamma-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE
1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE, gamma-ISOMER
HEXACHLOROCYCLOHEXANE, gamma-ISOMER
HEXATOX
HEXAVERM
HEXICIDE
HEXYCLAN
HGI
HORTEX
INEXIT
ISOTOX
JACUTIN
KOKOTINE
KWELL
LENDINE
LENTOX
LIDENAL
LINDAFOR
LINDAGAM
LINDAGRAIN
LINDAGRANOX
Lindane
gamma-LINDANE
LINDAPOUDRE
LINDATOX
LINDOSEP
LINTOX
LOREXANE
MILBOL 49
MSZYCOL
NA 2761
NCI-C00204
NEO-SCABICIDOL
NEXEN FB
NEXIT
NEXIT-STARK
NEXOL-E
NICOCHLORAN
NOVIGAM
OMNITOX
OWADZIAK
PEDRACZAK
PFLANZOL
QUELLADA
RCRA WASTE NUMBER U129
SANG gamma
SILVANOL
SPRITZ-RAPIDIN
SPRUEHPFLANZOL
STREUNEX
TAP 85
TRI-6
VITON

Back to top